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Effect of starting powder and microstructure on the aging process of 3Y-TZP

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Zirconia-based ceramics presents great interest for structural applications due to its high fracture toughness and mechanical strength. These mechanical properties are related to the stress-induced phase transition of tetragonal phase. However, when in contact with water, there is an accelerated martensitic transformation from metastable tetragonal to stable monoclinic phase, leading to microcracking with consequent degradation of these mechanical properties. This phenomenon is called hydrothermal degradation or aging process of tetragonal zirconia and prevents the use of zirconia-based ceramics as a biomaterial. Therefore, numerous studies has been developed in the last years with the objective of inhibit or minimize this aging process. This work evaluated the aging process of 3mol% Y2O3-stabilized tetragonal ZrO2 (3Y-TZP) samples obtained with two different starting powders, and sintered in different conditions. Samples were hydrothermally treated in autoclaves (134 ºC with different times), with posterior analysis of the phase-transformation and microstructure. It was possible to evaluate the effect of the starting powder characteristics and microstructure in the aging process of zirconia